Chapter 3-5

Parallel lines and triangles

**Vocabulary**

**Auxiliary line:**a line added to a drawing that helps illustrate a relationship.

**Interior angle**: an angle on the inside of a polygon.

**Exterior angle**: an angle outside a polygon that forms a linear pair with an interior angle.

**Postulate 3-2: the parallel postulate**

Through a point not on a line, ***there is one and only one line parallel to the given line***.

**.**

*P*

*r*

*P*

**.**

*s*

*r*

There is exactly one line (*s*) parallel to line *r* that goes through point P.

**Theorem 3-11: Triangle Angle-sum theory**

The sum of the interior angles of a triangle add up to 180 degrees.

*B*

*C*

*A*

m∠A + m∠B + m∠C = 180°

*1*

*3*

*2*

m∠1 + m∠2 + m∠3 = 180° (Linear angles)

*3*

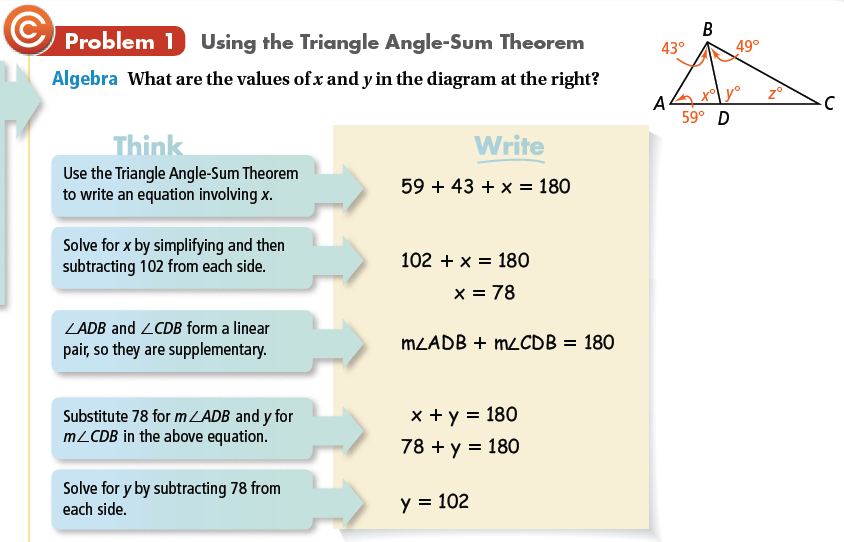
*1*

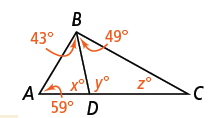
*2*

*5*

*4*

With the help of an auxiliary line we see that the other two interior angles of a triangle form *alternate interior angle pairs with angles 1 and 3, thus making them congruent.* It is easy to see that the interior angles must sum to 180°.



How would you find the measure of angle z?

Is there more than one way to find the measure of angle z?

**More vocabulary:**

**Remote interior angle:** an interior angle that *does not* form a linear pair with an exterior angle.

**Theorem 3-12: Triangle exterior angle theorem**

The measure of each exterior angle of a triangle equals *the sum of the measures of its two remote interior angles.*

*3*

*1*

*2*

*6*

*5*

*4*

In the above example, the measure of exterior angle 6 must equal the sum of the measure of angle 4 and angle 5.

m∠6 = m∠4 + m∠5

**Why?**

Given: m∠2 + m∠4 + m∠5 = 180°

Prove: m∠2 + m∠4 = m∠6

Hint: m∠5 + m∠6 = 180°

In-class task! Show the steps necessary to prove the above.

Steps:

m∠2 + m∠4 + m∠5 = 180° (given)

m∠5 + m∠6 = 180° (definition of a linear pair)

m∠5 = 180° - m∠6 (subtraction property of equality)

m∠2 + m∠4 + 180° - m∠6 = 180° (substitution)

m∠2 + m∠4 = 180° - 180° + m∠6 (subtraction)

m∠2 + m∠4 = m∠6 (simplification)